

TABLE 5.—NUMBER OF LIVING AND DEAD MAIZE SEEDLINGS FROM TWO PLANTINGS OF SEEDS X-RAYED (35 kr) AT VARIOUS HEAT TREATMENTS AND HELD AT ROOM TEMPERATURE FOR VARIOUS PERIODS BEFORE PLANTING.

First planting, November 26, 1940									Second planting, December 10, 1940									Total		
Mean elapsed time between x-raying and planting (days)	Heat treatment (50°C.) relative to time of x-raying						Irradiated controls at room temperature throughout		Mean elapsed time between x-raying and planting (days)	Heat treatment (50°C.) relative to time of x-raying						Irradiated controls at room temperature throughout				
	Before		During		After					Before		During		After						
	Living	Dead	Living	Dead	Living	Dead				Living	Dead	Living	Dead	Living	Dead					
6...	0	93	44	49	2	92	4	89	20...	0	96	23	70	0	95	3	93	76	677	753
33...	6	89	50	45	9	85	30	65	47...	4	92	43	50	10	84	12	82	164	592	756
55...	33	61	66	28	43	52	55	39	69...	26	70	60	35	20	74	31	63	334	422	756
69...	11	85	63	30	54	40	46	46	83...	9	87	50	47	34	61	39	46	306	442	748

BOTANY.—*Three new varieties and two new combinations in Citrus and related genera of the orange subfamily.*¹ WALTER T. SWINGLE, U. S. Bureau of Plant Industry.

In preparing an extended treatment of the taxonomy of the aurantioid plants, entitled "The Botany of Citrus and its Wild Relatives of the Orange Subfamily (Family Rutaceae, Subfamily Aurantioideae)," which will be published shortly, I have found it necessary to describe a few new genera, new species, and new varieties as well as to make a number of new combinations. This paper, and five others previously published since April 1939,² have cleared the ground for my new classification of the entire subfamily.

¹ Received November 28, 1941.

² SWINGLE, WALTER T. *A new taxonomic arrangement of the orange subfamily Aurantioideae.* Journ. Washington Acad. Sci. 28: 530-533. Dec. 1938.

—Clymenia and Burkillanthus, new genera, also three new species of Pleiospermium (Rutaceae-Aurantioideae). Journ. Arn. Arb. 20: 250-263, pls. 1-3. Apr. 1939.

—Limnocitrus, a new genus, also new species of Wenzelia. Paramignya and Atalantia (Rutaceae-Aurantioideae). Journ. Arn. Arb. 21: 1-25, pls. 1-4. Jan. 1940.

—New varieties and new combinations in the genera Clausena, Oxanthera, and Triphasia of the orange subfamily Aurantioideae. Journ. Washington Acad. Sci. 30: 79-83. Feb. 1940.

—Three new species of Citropsis, also new varieties of Atalantia and Fortunella (Rutaceae-Aurantioideae). Journ. Arn. Arb. 21: 116-133, pls. 1-4. Apr. 1940.

Citrus macroptera var. *Kerrii* Swingle, n. var.

Differt a specie fructu maiore, cortice fructus multe crassiore; vesiculis pulpiferis non solum ad parietes dorsales loculorum fructus sed etiam numerosissimis ad parietes laterales colligatis.

Differs from the typical form in having larger ovoid fruits, up to 8 or 9 cm in diameter instead of 5-5½ cm; pulp-vesicles attached in large numbers to the side (radial) walls of the locules for ¾ to ¾ of the distance from the dorsal walls of the segments to the core of the fruit; peel very thick, 12-14 instead of 5-6 mm, as in the typical form; flowers (known only from one collection, *Kerr 11983*) small, 4- or 5-merous with 16-20 stamens borne on slender, free filaments.

Type specimen.—Thailand, Nakwan Sawan, Kampéngpat, Mé Lamung, alt. 540 m; lat. 16°15' N.; long. 98°58' E., Dr. A. F. Q. Kerr, Herb. Aberdeen University No. 6081.

Remarks.—This interesting new orange is a member of the subgenus *Papeda*, the species of which have numerous droplets of acrid, bitter oil in the pulp-vesicles, because of which the fruits are inedible and are called bitter-oranges.

This variety was discovered by Dr. Kerr in west-central Thailand. At the type locality he reports it to be a "common tree in the ever-green forest" and also notes that it grows "up

to 10 meters high." The type material and another collection, *Kerr 11983*, from Ban Kragê, Thailand, were kindly lent to me by Prof. J. R. Matthews, curator of the Herbarium, University of Aberdeen, Scotland. This Thailand bitter-orange has long, stout, sharp spines on the lower branches (Fig. 1, B) but shorter ones or none on the fruiting branches (Fig. 1, C). This variety differs strikingly from the typical form of *Citrus macroptera* in having fruits with a much thicker, chalky-white peel covered by a thin,

19877). This material differs from the Thailand type specimens chiefly in having strongly acuminate leaves (Fig. 1, D), those of Dr. Kerr's collections being narrowed to a blunt apex (Fig. 1, B).

Citrus reticulata var. *austera* Swingle, n. var.

Differt a specie suco acidissimo; fructibus minoribus.

Differs from the typical form in having smaller fruits with intensely acid pulp.

Type.—Ch'ao-chou, Kwangtung Province.

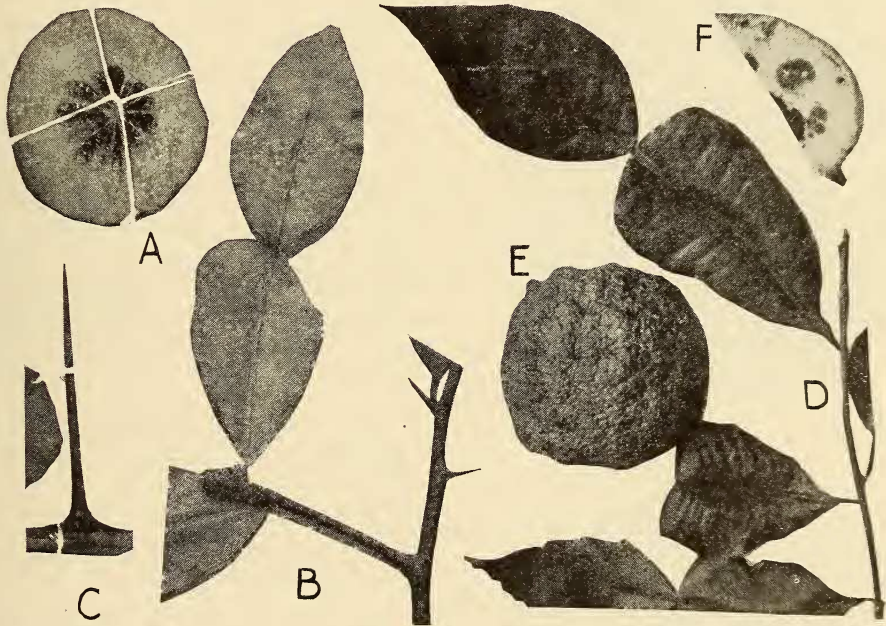


Fig. 1.—*Citrus macroptera* var. *Kerrii* Swingle, n. var: A, Fruit in cross section; B, fruiting branch with very short spines; C, long spine on young shoot (A, B, C all from the type specimen); D, twig with acuminate leaves; E, entire fruit; F, part of a cut fruit (D, E, F all from Tung Kung, Tonkin, Indochina, Groff 19877). One-half natural size.

green, surface layer only about 1 mm thick, which has numerous very small oil glands. The segments of the half-grown fruits contain very small pulp-vesicles only 1.5–2 mm long, borne on stalks 1–3 mm long, which are attached both to the dorsal wall of the locule and also in large numbers to the lateral (radial) walls for two-thirds to three-fourths of the distance from the dorsal wall of the locule to the core. Apparently this same variety occurs at Tung Kung (lat. 22°15' N., long. 102°50' E.) in northern Tonkin near the Chinese border (Groff

China, Groff 233 (1918), Herb. Lingnan University, Canton, China.

Remarks.—G. W. Groff in 1918 wrote a detailed description for me of this variety, called *suan chieh* in Chinese (*sün kat* in Cantonese), and commonly grown in the Swatow region of southeastern China for use as a rootstock. As it is grown from seeds and not propagated by grafting it is evidently able to reproduce itself indefinitely from seeds and is not to be confused with any of the numerous *Citrus* hybrids, mutations, and monstrosities, many of which

can be propagated only by grafting. I have drawn up from Groff's manuscript tabulations and outline figures wherein he compares the characters of 7 sour mandarin (*kat*) varieties the following description:

Fruits slightly depressed globose, 2.9–3.3 cm long, 3.3–3.6 cm diameter, with smooth, loose peel about 4 mm thick, capucine yellow (Ridgway's pl. 3) when ripe; oil glands small, round, far apart, fragrant; segments 9, easily separated; segment walls thin, tender, white; core

6–8 mm diam. soft; pulp deep chrome (Ridgway's pl. 3) composed of small, short pulp-vesicles, clinging together but irregularly arranged and easily broken; juice reddish yellow, very sour; seeds about 9, rounded at one end, pointed at the other, showing white parallel lines from base to tip; leaves lanceolate-elliptical, blades 6.8–2.5 cm, rather acutely cuneate at the base and narrowed to a blunt apex, with about 10 pairs of lateral veins; petioles nearly wingless.

This variety is widely grown about Swatow, China, where it is used as a rootstock upon which to graft the *mi-tang-ka*, honey-pot orange, and other famous varieties widely exported from Swatow.

Probably some of the other sour mandarins called *kat* by the Cantonese are forms of this variety. Some of the so-called *kat* varieties with large fruits, which as they ripen may become sweet enough to eat, are probably hybrids between this variety (*austera*) and sweet mandarins (*Citrus reticulata* Blanco) or sweet oranges (*Citrus sinensis* (Linn.) Osbeck). A hybrid between *Citrus reticulata* var. *austera* and some species of kumquat belonging to the genus *Fortunella* is commonly cultivated in *Citrus* collections under the name calamondin.

***Murraya alata* var. *hainensis* Swingle, var. nov.**

Differt specie folioliis junioribus minute puberulentibus.

Differs from the typical form in having the leaflets minutely pubescent on both surfaces when young, while the species itself has leaves always completely glabrous.

Type.—China, Hainan Island, Strand at Haichow, *McClure 7611*, Herb. Nat. Arboretum, Washington, D. C.

Remarks.—Both this variety and the typical form are very small trees with leaves having a plainly winged rachis and are distinct from other species of the genus *Murraya*.

***Clausena heptaphylla* var. *Engleri* (Tan.) Swingle, n. comb.**

Clausena Engleri Tan. in *Mededeel, van's Rijks Herb.* 69: 6. 1931.

***Murraya microphylla* (Merr. and Chun) Swingle, n. comb.**

Clausena microphylla Merr. and Chun in *Sunyatsenia* 2: 251. 1935.

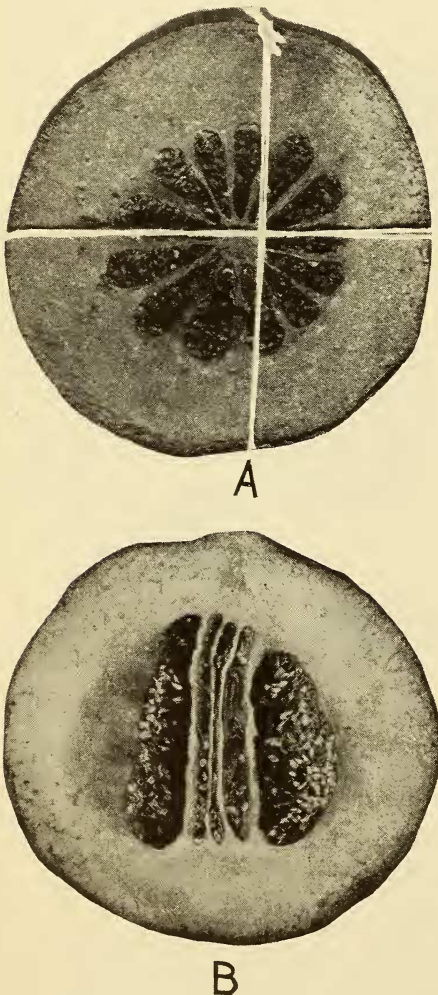


Fig. 2.—*Citrus macroptera* var. *Kerrii* Swingle, n. var. A, Cross section of half-grown dried fruit; B, longitudinal section of fruit, both fruits from the type tree showing thick white peel and minute pulp-vesicles. Natural size.